TOWNSEND AND TOWNSEND AND CREW LLP
ERIC P. JACOBS (State Bar No. 88413)
PETER H. GOLDSMITH (State Bar No. 91294)
ROBERT A. McFARLANE (State Bar No. 172650)
IGOR SHOIKET (State Bar No. 190066)
Two Embarcadero Center, 8th Floor
San Francisco, California 94111
Telephone: (415) 576-0200
Facsimile: (415) 576-0300
E-mail: epjacobs@townsend.com
phgoldsmith@townsend.com
ramcfarlane@townsend.com
ishoiket@townsend.com

Attorneys for Defendant and Counterclaimant
FAIRCHILD SEMICONDUCTOR CORPORATION

UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ALPHA & OMEGA SEMICONDUCTOR, INC., a California corporation; and ALPHA & OMEGA SEMICONDUCTOR, LTD., a Bermuda corporation, Plaintiffs and Counterdefendants, v. FAIRCHILD SEMICONDUCTOR CORP., a Delaware corporation, Defendant and Counterclaimant. AND RELATED COUNTERCLAIMS.	Case No. C 07-2638 JSW (EDL) (Consolidated with Case No. C 07-2664 JSW) **DECLARATION OF DR. RICHARD A. BLANCHARD IN SUPPORT OF FAIRCHILD'S REPLY CLAIM CONSTRUCTION BRIEF** Date: June 4, 2008 Time: 2:00 p.m. Courtroom: Hon. Jeffrey S. White

I, Dr. Richard A. Blanchard, declare as follows:

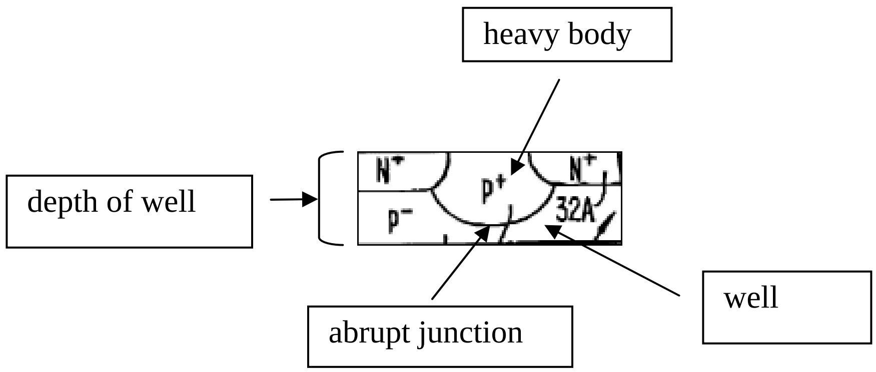
1. The "abrupt junction" claimed in the Fairchild patents refers to the transition between a heavy body and a well having the same conductivity type. In each claim where the "abrupt junction" language is found, the claim explicitly requires the heavy body and well regions to have the same conductivity type. Claim 1 of the '481 patent, for example, requires a "doped well having dopants of the second conductivity type," and a "doped heavy body having dopants of the second conductivity type." In other words, both the doped well and doped heavy body contain dopants of the same type -- the "second conductivity type." This means they both contain P-type dopants or they both contain N-type dopants. The claim does not permit one region to be P-type and the other N-type, as is the case in a P-N junction. Other claims of the Fairchild Mo patents contain the same requirement.

2. A novel aspect of the claimed invention is the use of an abrupt junction in combination with other claim limitations, including the requirement that the heavy body and well regions have the same conductivity type. As I explained in my declaration dated March 13, 2008, the specification and prosecution history describe the claimed "abrupt junction" as being a transition between the heavy body and the well that occurs over a short distance relative to the depth of the well. The support for this interpretation includes Figure 5 in the specification and related text.

3. I understand that AOS agrees that the specification defines an "abrupt junction" as being a junction between a heavy body and well having the same conductivity type. (AOS Resp. Brief at p. 4. ("[I]t is used in the specification of the Mo patents to describe an electrical transition between the heavy body and a well of the same conductivity type."). Because the claimed invention requires the "abrupt junction" to be between regions of the same conductivity type, a person of ordinary skill in the art would understand the definition set forth in the specification is the proper one.

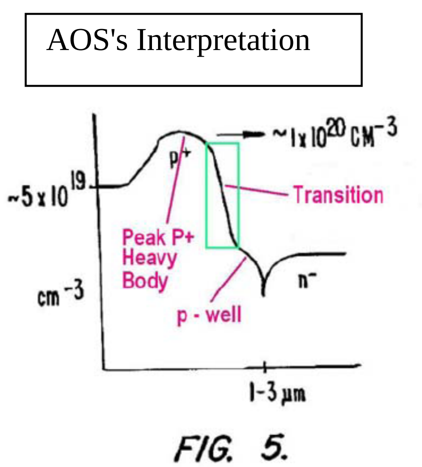
4. I understand AOS criticizes Fairchild's construction of "abrupt junction" on the grounds that the transition distance of the abrupt junction should not be measured compared to the depth of the well. I disagree. As I explained in my declaration dated March 13, 2008, the specification defines an "abrupt junction" in the context of the claimed invention as being a transition that occurs over a short distance relative to the depth of the well. This definition requires an assessment of the extent to which the transition is "short." A person of ordinary skill in the art would understand that the word "short" is

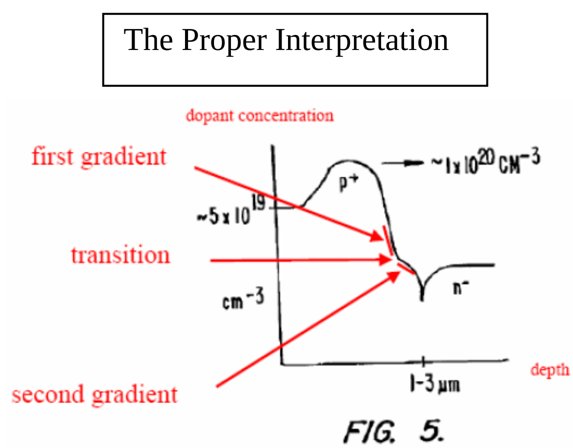
a relative term, and that the relative length of the transition must be compared to the length of something else. In short, there must be some scale for measuring the length of the transition. In the context of the Fairchild patents, the appropriate measuring stick is the depth of the well. This conclusion is true because, as illustrated below, the heavy body is formed in the well, and thus the abrupt junction is located at a depth less than the depth of the well.



('481 patent, portion of Fig. 1B (annotated).) The length of the transition between the heavy body and the well would be considered short if the depth of the well is much greater than the length of the transition. However if the well depth were only slightly greater than the transition length, the same transition would not be considered to be short to a person of ordinary skill in the art.

5. I also understand that AOS criticizes Fairchild's construction of "abrupt junction" on the grounds Fairchild allegedly identifies the wrong location of the transition which forms the abrupt junction. AOS states that the proper location of the transition is the steep line in the middle of the dopant concentration profile. I disagree.





6. AOS's interpretation is incorrect because it identifies an area (the green rectangle) as the transition between the heavy body and well, even though that area is part of the heavy body itself. The transition between the heavy body and well plainly cannot occur within the heavy body. The prosecution history confirms AOS's position is incorrect. In describing the above figure during prosecution, Fairchild stated:

> Notice that the peak p+ heavy body is at a predetermined depth in the p-well and changes rapidly in a short further depth (i.e., has a steep doping concentration gradient) to form the abrupt transition with the p-well.

(September 5, 2008 Response at p. 8.) The above text explains that the abrupt junction is the transition between the heavy body and well, as shown in the above figure on the right. It cannot be the steep slope or gradient shown in the green rectangle, as AOS urges, because that gradient is part of the heavy body, not a transition between the heavy body and well. (*Id.* ("the peak p+ heavy body . . . changes rapidly in a short further depth (i.e., has a steep doping concentration gradient)".)

7. I disagree with AOS's argument that Fairchild's proposed construction provides no objective measure of what constitutes an abrupt junction. Junctions typically can be considered either abrupt or linearly graded. Based on the teachings in the specification, a person of ordinary skill in the art would understand whether a junction is abrupt or not, based on Fairchild's proposed construction. The specification of the Fairchild patents teaches there is an "abrupt junction" when there is an abrupt change in slope in a dopant concentration profile, as shown in Figure 5 of the Fairchild patents. The specification also provides an example of a process for making an "abrupt junction," and describes other processes that may be used. ('481 patent, col. 7, lines 18-42.) Accordingly, AOS's argument that Fairchild's proposed construction is indefinite is not correct.

8. I understand AOS contends the term "abrupt junction" should be interpreted based on the description of that concept in the prosecution history that refers to a book authored by S.M. Sze ("Sze "). AOS apparently contends Fairchild defined the term "abrupt junction" for purposes of the claimed invention in the same way as that term is used in the Sze text. I disagree. A person of ordinary skill in the art would not understand that "abrupt junction" should be interpreted according to that reference. As AOS admits, Sze discusses the concept of an abrupt junction in the context of a junction between regions having different conductivity types, i.e., a P-N junction. The definition

employed in Sze does not apply to the claim invention, however. As I discussed above, the claims are limited to transitions between regions having the same conductivity type, and the specification and prosecution history describe what the term "abrupt junction" means in that context. A person of ordinary skill in the art would not understand that the term should be interpreted based on the teachings of the Sze text, which relates to a completely different type of junction.

9. I disagree with AOS's argument that claim 29 of the '111 patent must be construed to require measuring avalanche current at breakdown initiation for the claim to make technical sense. In my earlier declaration in support of Fairchild's opening claim construction brief, I explained why it is illogical to measure the uniformity of avalanche current at the initiation of avalanche breakdown since, at that point in time, only a single electron is in the avalanche state. AOS apparently contends that measuring avalanche current at a time after breakdown initiation would permit any dopant profile to be used, in violation of the claimed requirement that the dopant profile be "adjusted." I disagree. The claim requires "adjusting a dopant profile . . . so that peak electric field is moved away from a nearby trench toward the heavy body resulting in avalanche current that is substantially uniformly distributed." ('111 patent, col. 11, lns. 7-10.) This means the claim requires a relationship between the "adjusting" step and the uniformity of the avalanche current, even if the current is measured subsequent to breakdown initiation. As a result, AOS is incorrect in asserting that any dopant profile would satisfy the claim requirements if avalanche current were measured after breakdown initiation.

10. I understand that AOS argues that a field plate must by increase breakdown voltage in the termination region by "modifying the depletion layer in the underlying silicon." As I stated in my declaration in support of Fairchild's opening claim construction brief, this definition of a field plate is appropriate only for planar field plates, such as those shown and described in the Baliga Text and the Ghandhi Text. A simple comparison of the figures of the Baliga Text and the '947 patent show the fundamental differences between the two structures:

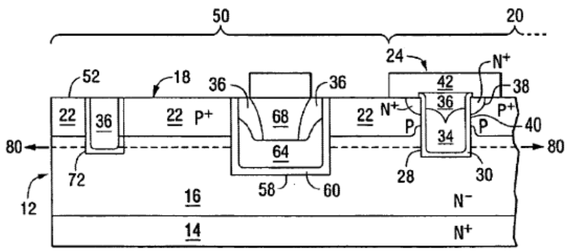


FIG. 1

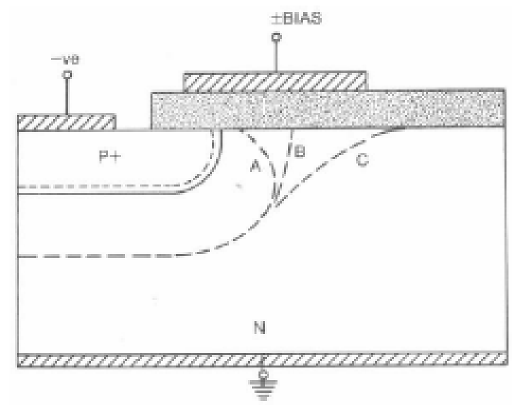


Figure 1 of the '947 patent shows a field plate that is formed partially in a trench. Figure 3.44 of the Baliga Text, on the other hand, shows a planar field plate that is formed entirely on the surface of the semiconductor device. Because of the structural differences between the device shown in Figure 1 of the '947 patent, and that shown in the Baliga Text, the way the field plate affects the depletion layers will change. Specifically, the field plate shown in Figure 1 of the '947 patent will affect the depletion layer alongside the field plate (not underneath the field plate). For this reason, AOS's proposed construction is far too narrow, and in particular fails to cover field plate structures such as the one shown in Figure 1 of the '947 patent.

11. AOS's proposed construction is also illogical to a person of ordinary skill in the art for another reason. The portion of a field plate that affects nearby depletion layers in the device varies depending upon the voltages applied to the device, and in particular the voltage applied to the field plate relative to the drain. If there is a relatively large difference in voltage, a larger portion of the field plate will affect the depletion layers. If the difference between those two voltages is low, on the other hand, a smaller portion of the field plate will affect the depletion layers. Therefore, under AOS's proposed construction, the portion of a structure that constitutes a field plate will change based upon the operating parameters of the device. A person of ordinary skill in the art would not define a field plate in a manner that would allow the scope of the definition to change based upon the voltages applied.

12. There appears to be an inconsistency between Dr. Salama's declaration and AOS's opposition brief. AOS's proposed construction requires that the isolation trench be filled with a "dielectric material." (A dielectric material acts as an insulator.) Dr. Salama's declaration, however,

gives his opinions regarding the purported difficulty of cutting through an “oxide” in a trench. The terms “dielectric material” and “oxide” are not synonyms. An oxide is only one type of dielectric among many. Based upon my reading of claim 1, I do not believe that there is any requirement that an isolation trench be filled with anything during manufacturing, let along a dielectric material such as an oxide. Claim 1 simply states that the isolation trench must be located between the edge of the device and the combined gate runner/feed. Even if the claims required that the isolation trench must be filled with a dielectric material, such materials are not limited to oxides. For example, air is a dielectric material. So under AOS’s proposed construction, an isolation trench can be filled with air. The packaging material in which a semiconductor device is encapsulated is also a dielectric material. Therefore, I believe that Dr. Salama’s opinions based upon cutting through an oxide in a trench have no bearing on the meaning of the term “isolation trench.”

13. Dr. Salama’s second and third arguments are refuted by the fact that it is common in the field of semiconductor devices cut through trenches formed between adjacent devices on a semiconductor wafer to separate those devices during the singulation process. One very common example of a device that typically is manufactured in this way is a mesa transistor. A mesa transistor is merely a transistor having diffused base and emitter regions. Examples of mesa transistors after singulation are shown in the following figures:

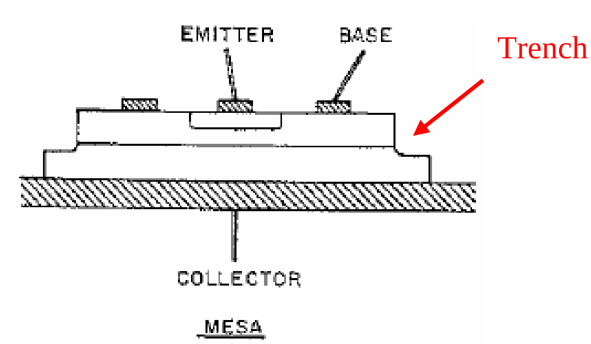


Figure 1

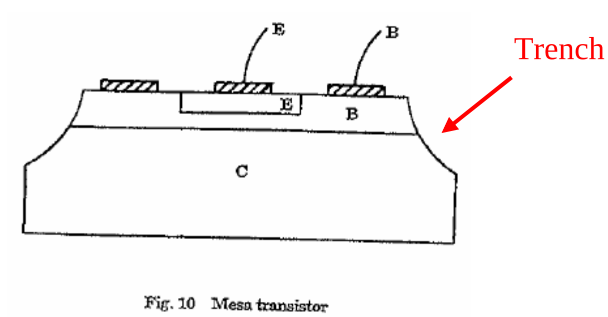


Figure 2

Figure 1 is from the textbook "Microelectronics Theory, Design, and Fabrication," edited by Dr. Edward Keonjian. The section in which Figure 1 appears was written by Dr. Gordon Moore, one of the three founders of Intel Corporation and one of the preeminent engineers in the world in the field of

microelectronics. Figure 2 is from the textbook "Modern Microelectronics," by Dr. Max Fogel. As can be seen in both of these examples of mesa transistors, a trench has been formed along either side of the device, and the trench has been cut through during the singulation process, leaving a trench on either side of the device.

14. An exemplary technique for forming a mesa transistor is shown in U.S. Patent No. 4,355,457 ("the '457 patent"). Figure 1 shows multiple mesa transistors on a single semiconductor wafer before singulation. Parallel "channels" are formed by mechanically cutting partially through the wafer on opposite sides of each device. The channels are subjected to a light etch, forming, resulting in the structure shown in Figure 4. A laser is used to form grooves into the wafer at the midpoint of each of the channels. After the grooves are formed, the devices are separated into separate devices, such as that shown in Figure 5.

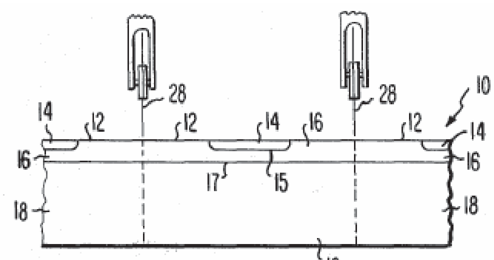


Fig.1

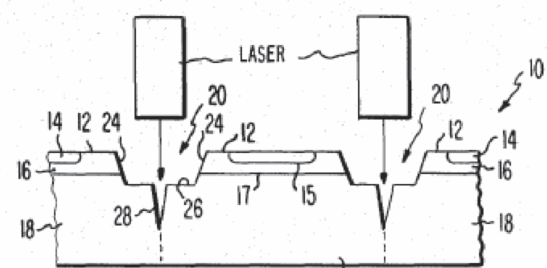


Fig.4

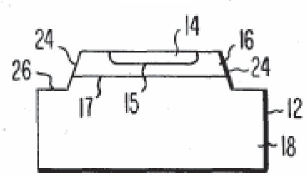


Fig.5

The channels, which are trenches, are formed along the edges of the device shown in Figure 5 of the '457 patent. Like the "isolation trench" of the '947 patent, the channels of the '457 patent serve the function of providing electrical isolation between the transistor and any structures on the side and/or bottom of the device. As stated in the background section of the '457 patent, other techniques such as chemical etching could be used to form the channels. The '457 patent provides an example of common techniques used to form mesa transistors.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge and belief.

Executed this 7th day of April, 2008, in Mountain View, California.

Richard A. Blanchard

Richard A. Blanchard, Ph.D.

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